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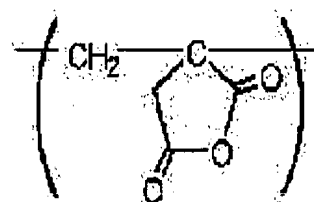
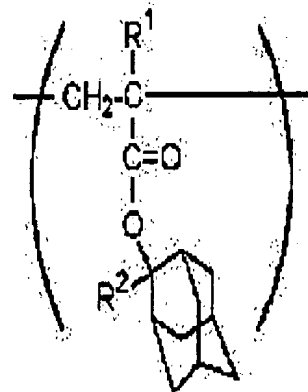
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(54) CHEMICAL AMPLIFICATION TYPE POSITIVE RESIST COMPOSITION

(57)Abstract:

PROBLEM TO BE SOLVED: To improve dry etching resistance, resolution and adhesiveness by combining specified two polymn. units.

SOLUTION: The resist compsn. contains a resin contg. polymn. units of formulae I and II and an acid generating agent. In the formulae I and II, R¹ is H or methyl, R² is 1-4C alkyl and this alkyl is advantageously linear but may be branched and is, e.g. methyl, ethyl, n-propyl, isopropyl or n-butyl. The resin can be produced by copolymerizing a 2-alkyl-2-adamantyl (meth)acrylate and maleic anhydride as essential constituent monomers. Butyrolactone residues are preferably incorporated into the resin from the viewpoint of adhesiveness. The butyrolactone residues may be substd. by alkyl.



LEGAL STATUS

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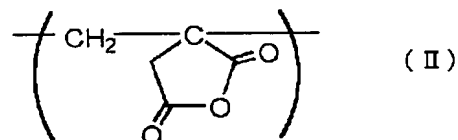
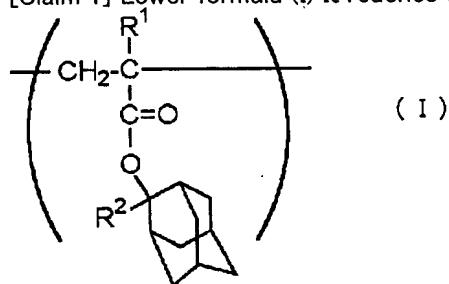
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CLAIMS

[Claim(s)]

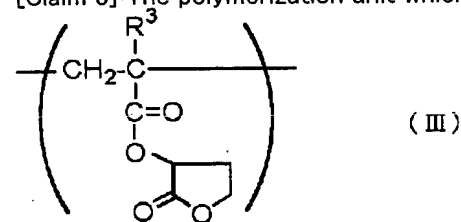
[Claim 1] Lower formula (I) It reaches (II).



It is the chemistry amplification type positive-resist constituent characterized by containing the resin containing each polymerization unit shown by (R¹ expresses hydrogen or a methyl among a formula, and R² expresses the alkyl of carbon numbers 1-4), and an acid generator.

[Claim 2] The constituent according to claim 1 with which this resin includes further the polymerization unit which has the butyrolactone residue which may be replaced by the alkyl.

[Claim 3] The polymerization unit which has a butyrolactone residue is a lower formula (III).



It is the constituent according to claim 2 shown by (R³ expresses hydrogen or a methyl among a formula).

[Claim 4] The constituent according to claim 1 to 3 which comes to melt this resin and this acid generator in the solvent containing 2-heptanone.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the chemistry amplification type positive-resist constituent used for micro processing of a semiconductor.

[0002]

[Description of the Prior Art] The lithography process which used the resist constituent is usually adopted as micro processing of a semiconductor, and it sets to lithography, and is a rayleigh. (Rayleigh) It is so possible that exposure wavelength is theoretically short so that it may be expressed with the formula of a diffraction limitation to raise resolution. The exposure light source for lithography used for a manufacture of a semiconductor serves as g line with a wavelength of 436nm, i line with a wavelength of 365nm, and KrF excimer laser with a wavelength of 248nm to short wavelength every year, and promising ** of the ArF excimer laser with a wavelength of 193nm is carried out as exposure light source of the next generation.

[0003] The time when the lens used for ArF excimer laser exposure machine is **ed by ArF excimer laser light compared with the thing for the conventional exposure light sources since a life is short has a desirable thing short as much as possible. For that purpose, since it is necessary to raise the photographic sensitivity of a resist, the catalysis of the acid generated by exposure is used and the so-called chemistry amplification type resist containing the resin which has the base which ****s with the acid is used.

[0004] In order for the resin used for the resist for ArF excimer laser exposure not to have a ring in order to secure the permeability of a resist, and to give dry etching resistance, it is known that what has an alicyclic ring instead of a ring is good. It is D.C. Hofer, Journal of Photopolymer Science and Technology, Vol.9, and No.3 (1996) 387-398 until now as such a resin. Various kinds of resins which are indicated are known. However, conventionally, by the well-known resin, when especially the polarity is insufficient, there is a problem are easy to cause development peeling, from the shortage of an adhesive property at the time of development.

[0005]

[Problem(s) to be Solved by the Invention] The purpose of this invention is the chemistry amplification type positive-resist constituent which contained the resinous principle and the acid generator and fitted excimer laser lithography, such as ArF and KrF, and it is to offer what is excellent in especially the adhesive property to a substrate while various kinds of resist performances, such as photographic sensitivity and resolution, are good.

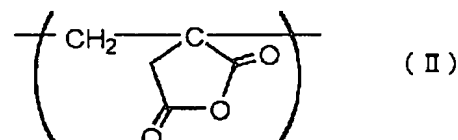
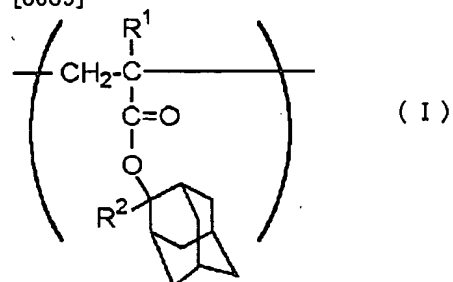
[0006] As a resin which constitutes a chemistry amplification type positive-resist constituent, by using what has the polymerization unit of specific structure, this invention persons found out that the adhesive property to a substrate was improved, and completed this invention.

[0007]

[Means for Solving the Problem] That is, this invention offers the resin containing both polymerization units drawn from the polymerization unit and itaconic acid anhydride of the acrylic-ester system which has 2-alkyl-2-adamanthyl as a ***** machine (meta), and the chemistry amplification type positive-resist constituent which comes to contain an acid generator.

[0008] Here, the polymerization unit which the polymerization unit of the acrylic-ester system which has 2-alkyl-2-adamanthyl as a ***** machine (meta) means the unit of the 2-alkyl-2-adamanthyl (meta) acrylate origin shown by the lower formula (I), and is drawn from itaconic acid anhydride means the unit shown by the lower formula (II).

[0009]



[0010] The inside of a formula, and R1 Hydrogen or a methyl is expressed and it is R2. The alkyl of carbon numbers 1-4 is expressed.

[0011]

[Embodiments of the Invention] The resin which has the polymerization unit of the above-mentioned formula (I) is a publication number. The resin which is indicated by 9 No. -73173 official report, and has the polymerization unit of the above-mentioned formula (II) is a publication number. 7-234511 Although indicated by the number official report, dry etching resistance, resolution, and an adhesive improvement are achieved by combining these two polymerization units. R2 in a formula (I) You may branch, although it is the alkyl of carbon numbers 1-4 and it is usually advantageous that it is a straight chain as for this alkyl. Specifically, a methyl, an ethyl, n-propyl, an isopropyl, n-butyl, etc. are mentioned. The resin containing each polymerization unit of a formula (I) and a formula (II) can be manufactured by performing copolymerization, using acrylic-acid (meta) 2-alkyl-2-adamantyl and a maleic anhydride as a respectively indispensable configuration monomer.

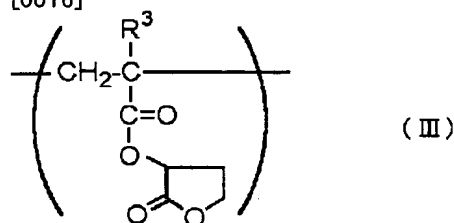
[0012] Moreover, this resin may include polymerization units other than a formula (I) and a formula (II). Other polymerization units which may be contained arbitrarily do not have a ring, but are desirable. [of the thing which has cyclic structures, such as an alicyclic ring, a lactone residue, and cyclic-anhydride residues other than a formula (II),] an alicyclic ring -- especially -- an alicyclic hydrocarbon residue and it -- bridge formation -- it is desirable that it is a hydrocarbon ring, for example, a bornane ring, a norbornane ring, a tricyclodecane ring, a tetracyclo dodecane ring, an adamantane ring, etc. are mentioned The polymerization unit more specifically drawn from the vinyl ester or isopropenyl ester of a polymerization unit and an alicyclic carboxylic acid drawn from the alicyclic ester of an acrylic acid (meta) can be mentioned. Furthermore, the carboxylic-acid machine and alcohol nature hydroxyl group of disengagement can also be contained partially.

[0013] It is desirable to make a butyrolactone residue contain in a resin especially especially from an adhesive viewpoint. Even if the butyrolactone residue here did not replace, it may be replaced by the alkyl and this alkyl can be about one to four carbon number like a methyl, an ethyl, a propyl, and butyl. This butyrolactone residue is combinable with a resin matrix in the type of for example, ester combination or ether linkage. Although especially the position of the joint hand in a butyrolactone residue is not limited, the joint hand has come from the alpha position (namely, 2-grade) of a butyrolactone, for example. the type [like the ester of an acrylic acid or a methacrylic acid] such whose a butyrolactone residue is -- it is -- the principal chain of a resin -- direct -- a rope -- you may be -- an alicyclic ring -- a butyrolactone residue -- ester combination -- or ether linkage may be carried out and ester combination or the type which carries out ether linkage is sufficient as the alicyclic ring at the principal chain of a resin

[0014] Although the technique of generally carrying out copolymerization of the monomer which has a butyrolactone residue with aforementioned 2-alkyl-2-adamantyl methacrylate and aforementioned itaconic acid anhydride is adopted in order to introduce a butyrolactone residue into a resin, the technique of making butyrolactone ester the resin which has a carboxylic-acid machine and an alcohol nature hydroxyl group, or using it as the butyrolactone ether can also be adopted. The halogenation field of the butyrolactone which may be replaced by the alkyl can be used for the esterification and etherification for introducing a butyrolactone residue into a monomer or a resin. As a monomer which has a butyrolactone residue, they are alpha-***** yloxy-gamma-butyrolactone, alpha-meta-***** yloxy-gamma-butyrolactone, and alpha-***** yloxy, for example. - beta and beta-dimethyl-gamma-butyrolactone etc. is mentioned.

[0015] Typically as a polymerization unit which has a butyrolactone residue, it is a lower formula (III). What is shown can be mentioned.

[0016]



[0017] The inside of a formula, and R3 Hydrogen or a methyl is expressed.

[0018] Moreover, generally by the resin insoluble to alkali in itself which a part of base ***** by operation of an acid, and after ***** serves as an alkali fusibility, and is used for this invention although it carries out [are and] and is refractory, the 2-alkyl-2-adamantyl machine in the aforementioned formula (I) ***** the resin for chemistry amplification type positive resists by operation of an acid. Therefore, although the resist constituent which contains this resin by having the polymerization unit of a formula (I) acts on a positive type, you may include other polymerization units which have the base which ***** by operation of an acid if needed.

[0019] As other bases which ***** by operation of an acid, specifically The various ester of a carboxylic acid, for example, about one to six carbon number [which is represented by tert-butyl ester] alkyl ester, Methoxymethyl ester, an ethoxy methyl ester, 1-ethoxy ethyl ester, 1-iso butoxy ethyl ester, 1-isopropoxy ethyl ester, 1-ethoxy propyl ester, 1-(2-methoxyethoxy) ethyl ester, 1-(2-acetoxyethoxy)ethyl ester, 1-[- (1-adamantyloxy) 2 *****] ethyl ester, Alicyclic ester like 1-[- (1-adamantane carbonyloxy) 2 *****] ethyl ester, tetrahydro-2-furanyl ester, acetal type ester like tetrahydro-2-pyranyl ester, and isobornyl ester etc. is mentioned. The monomer for leading to the polymerization unit which has such a carboxylate An acrylic thing like a methacrylic ester or an acrylic ester may be used, and like a norbornene carboxylate, a tricyclo decene carboxylate, and a tetracyclo decene carboxylate What the carboxylate machine combined with the alicyclic monomer may be used. further Iwasa et al, Journal of Photopolymer Science and Technology, Vol.9, and No.3 (1996) 447-456 As [indicate] The thing in which an acrylic acid or a methacrylic acid, and ester, were formed is sufficient as the alicyclic machine of an alicyclic carboxylate.

[0020] Although the resin used by this invention is changed according to the modality of radial slit for patterning exposure, the modality of other polymerization units included arbitrarily, it is desirable to contain the polymerization unit shown by the formula (I) and the formula (II) in [20 - 70 mol %] generally, respectively, and the polymerization unit which has a butyrolactone residue may be contained in not more than 70 mol %. Furthermore, when it includes the polymerization unit which has the base which ***** by the operation of an acid of those other than the polymerization unit shown by the formula (I), as for the amount, about [50 mol % less than] is desirable. the

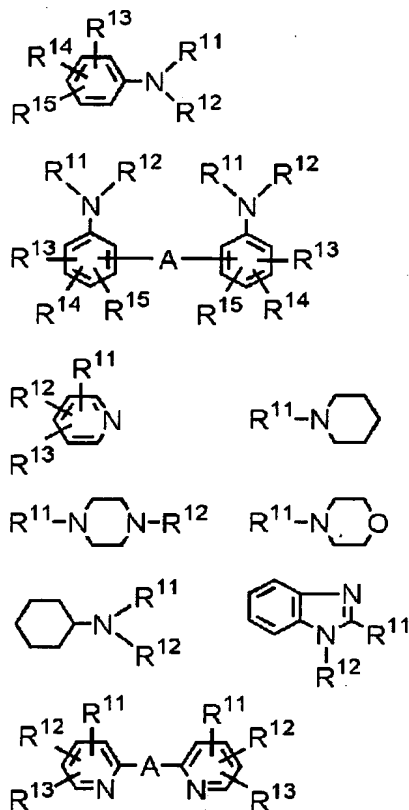
polymerization unit which has an alicyclic ring although it is not necessary to establish the polymerization unit which has an alicyclic ring apart from it, since this resin has an alicyclic ring in the polymerization unit of a formula (I) -- the whole -- more than 20 mol % -- existing is desirable

[0021] By making radial slits, such as light and an electron ray, act on the matter itself or the resist constituent containing the matter, the matter decomposes and the acid generator which is another component generates an acid. The acid generated from an acid generator acts on the aforementioned resin, and it is also made ***** when other bases which ***** the 2-alkyl-2-adamantyl in a formula (I) in an operation of an acid again exist. For example, an onium salt compound, an organic halogenated compound, a sulfone compound, a sulfonate compound, etc. are included by such acid generator. Specifically, the following compounds can be mentioned.

[0022] Diphenyliodonium Trifluoromethane sulfonate, 4-methoxyphenyl phenyliodonium Hexafluoroantimonate, 4-methoxyphenyl phenyliodonium Trifluoromethane sulfonate, Screw (4-tert-buthylphenyl) iodonium Tetrafluoroborate, Screw (4-tert-buthylphenyl) iodonium Hexafluorophosphate, Screw (4-tert-buthylphenyl) iodonium trifluoromethane sulfonate, [0023] Triphenylsulfonium Hexafluorophosphate, triphenylsulfonium Hexafluoroantimonate, Triphenylsulfonium Trifluoromethane sulfonate, 4-methoxyphenyl diphenyl sulfonium Hexafluoroantimonate, 4-methoxyphenyl diphenyl sulfonium Trifluoromethane sulfonate, 4-methylphenyl diphenyl sulfonium Trifluoromethane sulfonate, 2, 4, 6-trimethyl phenyl diphenyl sulfonium Trifluoromethane sulfonate, 4-tert-buthylphenyl diphenyl sulfonium Trifluoromethane sulfonate, 4-phenylthiophenyl diphenyl sulfonium Hexafluorophosphate, 4-phenylthiophenyl diphenyl sulfonium Hexafluoroantimonate, 1-(2-naphtoylmethyl)thiolanium Hexafluoroantimonate, 1-(2-naphtoylmethyl)thiolanium Trifluoromethane sulfonate, 4-hydroxy-1-naphthyl dimethyl sulfonium Hexafluoroantimonate, 4-hydroxy-1-naphthyl dimethyl sulfonium Trifluoromethane sulfonate, [0024] The 2-methyl -4, 6-screw (***** methyl)-1,3,5-triazine, 2, 4, 6-tris (***** methyl)-1,3,5-triazine, The 2-phenyl -4, 6-screw (***** methyl)-1,3,5-triazine, 2-(4-chlorophenyl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(4-methoxyphenyl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(4-methoxy-1-naphthyl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(***** [d] [1, 3] dioxolane-5-****)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(4-methoxy styryl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(3, 4, 5-trimethoxy styryl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(3, 4-dimethoxy styryl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(2, 4-dimethoxy styryl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(2-methoxy styryl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(4-butoxy styryl)-4, 6-screw (***** methyl)-1,3,5-triazine, 2-(4-pentyloxy styryl)-4, 6-screw (***** methyl)-1,3,5-triazine, [0025] 1-benzoyl-1-phenyl methyl P-toluene sulfonate (common-name benzoin tosylate), 2-benzoyl-2-hydroxy-2-phenylethyl P-toluene sulfonate (common-name alpha-methylol benzoin tosylate), 1 and 2, 3-benzene Trier Tris methanesulfonate, 2, 6-dinitro benzyl P-toluene sulfonate, 2-nitrobenzyl P-toluene sulfonate, 4-nitrobenzyl P-toluene sulfonate, [0026] Diphenyl Disulfon, G p-tolyl Disulfon, a screw (phenyl sulfo nil) diazomethane, a screw (4-chlorophenyl sulfo nil) diazomethane, a screw (p-tolyl sulfo nil) diazomethane, a screw (4-tert-buthylphenyl sulfo nil) diazomethane, a screw (2, 4-xylyl sulfo nil) diazomethane, a screw (cyclohexyl sulfo nil) diazomethane, a diazomethane (phenyl (benzoyl) sulfo nil), [0027] N-(***** succinimide, N-(trifluoromethyl sulfonyloxy)succinimide, N-(trifluoromethyl sulfonyloxy)phthalimide, N-(trifluoromethyl sulfonyloxy)-5-norbornene -2, 3-dicarboxyimide, N-(trifluoromethyl sulfonyloxy)naphthalimide, N-(10-***** imide, etc.

[0028] Moreover, it is known that the performance degradation by deactivation of the acid generally accompanied by the basic compound, especially the basic nitrogen-containing organic compound, for example, an amines, every length after exposure by adding as a quencher in a chemistry amplification type positive-resist constituent will be improvable, and it is desirable to blend such a basic compound also in this invention. What is shown by each following formula as a concrete example of the basic compound used for a quencher is mentioned.

[0029]



[0030] R11, R12, R13, R14, and R15 express mutually the alkyl which may be independently replaced with hydrogen and a hydroxyl group, cycloalkyl, an aryl, or ***** among a formula, and A expresses an alkylene, a carbonyl, or ***** It can be the alkyl expressed with R11-R15 and alkoxy **, and about one to six carbon number here, and cycloalkyl can be about five to ten carbon number, and an aryl can be about six to ten carbon number. Moreover, the alkylene expressed with A can be about one to six carbon number, and may branch also by the straight chain.

[0031] It is desirable that the resist constituent of this invention contains a resin at 80 - 99.9 % of the weight, and contains an acid generator in 0.1 - 20% of the weight of the domain on the basis of the total-solid weight. Moreover, when using the basic compound as a quencher, it is desirable to contain in 0.0001 - 0.1% of the weight of the domain on the basis of the total-solid weight of a resist constituent similarly. This constituent can also carry out little inclusion of various kinds of additives, such as a sensitizer, a lysis retardant, other resins, a surfactant, a stabilizer, and a color, again if needed.

[0032] Each above-mentioned component usually serves as resist liquid in the status that it was melted in the solvent, and the resist constituent of this invention is applied on bases, such as a silicon wafer. The solvent used here melts each component, has a suitable rate of drying, and after a solvent evaporates, it can usually be used in this field that what is necessary is just what gives a uniform and smooth paint film. For example, the ester like the glycol ether ester like ethylcellosolve acetate, methyl-cellosolve acetate, and propylene-glycol-monomethyl-ether acetate, an ethyl lactate, butyl acetate, amyl acetate, and a pyruvic-acid ethyl, an acetone, a methyl isobutyl ketone, 2-heptanone and the ketones like a cyclohexanone, and the cyclic ester like gamma-butyrolactone can be mentioned. These solvents are independent, respectively, or can be combined two or more sorts and can be used. The result which was excellent in application nature in 2-heptanone when [of a solvent] a part was presupposed at least, for example, the whole solvent used 50% of the weight or more, and was excellent also in resolution especially is obtained.

[0033] It is applied on a base, exposure processing for patterning is performed, and after performing heat-treatment for subsequently promoting a deprotection machine reaction, negatives are developed by the dried resist layer with an alkali developer. Although the alkali developers used here can be various kinds of alkaline aqueous solutions used in this field, generally the aqueous solution of tetramethylammonium hydroxide or trimethylammonium (2-hydroxyethyl) hydroxide (common-name choline) is used in many cases.

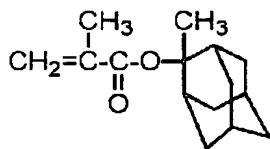
[0034]

[Example] Next, although an example is given and this invention is explained still concretely, this invention is not limited at all by these examples. The section in an example is weight criteria as long as there is no special mention.

[0035] The synthetic example 1 (synthesis of a monomer)

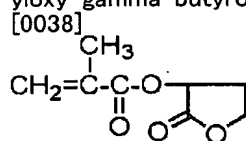
2-methyl-2-Ada ***** Norian 83.1g and triethylamine 101g were taught, the 200g methyl isobutyl ketone was added, and it considered as the solution. 78.4g (it is 1.5 mol twice to a 2-methyl-2-Ada ***** Norian) of methacrylic acid chlorides was dropped there, and it stirred at the room temperature after that for about 10 hours. The organic layer was washed in the sodium-bicarbonate aqueous solution 5% of the weight after filtration, and it rinsed twice by continuing. After condensing an organic layer, vacuum distillation was carried out and the methacrylic-acid 2-methyl-2-adamantyl shown by the following formula was obtained at 75% of yield.

[0036]



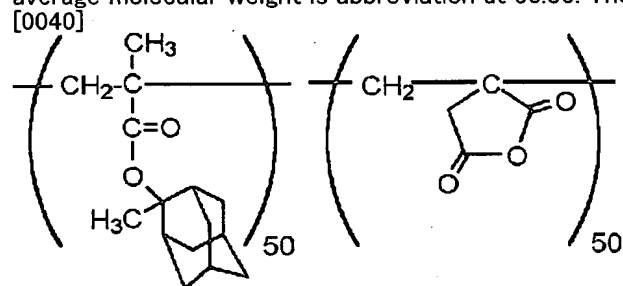
[0037] The synthetic example 2 (synthesis of another monomer)

100g of alpha-*****-gamma-butyrolactone and 104.4g (it is 2.0 mol twice to alpha-*****-gamma-butyrolactone) of methacrylic acids were taught, the twice [3 weight] as many methyl isobutyl ketone as alpha-*****-gamma-butyrolactone was added, and it considered as the solution. Triethylamine 183.6g (it is 3.0 mol twice to alpha-*****-gamma-butyrolactone) was dropped there, and it stirred at the room temperature after that for about 10 hours. The organic layer was washed in the sodium-bicarbonate aqueous solution 5% of the weight after filtration, and it rinsed twice by continuing. The organic layer was condensed and the alpha-meta-***** yloxy-gamma-butyrolactone shown by the following formula was obtained at 85% of yield.



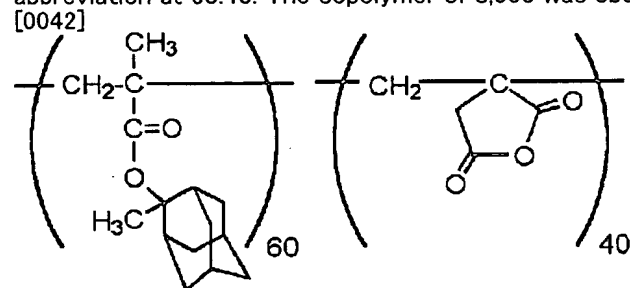
[0039] The synthetic example 3 (synthesis of a resin A1)

The methacrylic-acid 2-methyl-2-adamantyl and itaconic acid anhydride which were obtained in the synthetic example 1 were taught by the mole ratio (20.0g : 9.6g) of 50:50, the twice [2 weight] as many methyl isobutyl ketone as all monomers was added, and it considered as the solution. there -- initiator ***** -- an azobisisobutyronitril -- the total amount of monomers -- receiving -- one mol % -- it added and heated at 90 degrees C for about 8 hours. Then, operation of having filled a lot of heptanes with a reaction mixture, and settling it was performed twice, and was refined. Consequently, it is shown by the following formula and, for the composition mole ratio of each unit, weight average molecular weight is abbreviation at 50:50. The copolymer of 8,000 was obtained.



[0041] The synthetic example 4 (synthesis of a resin A2)

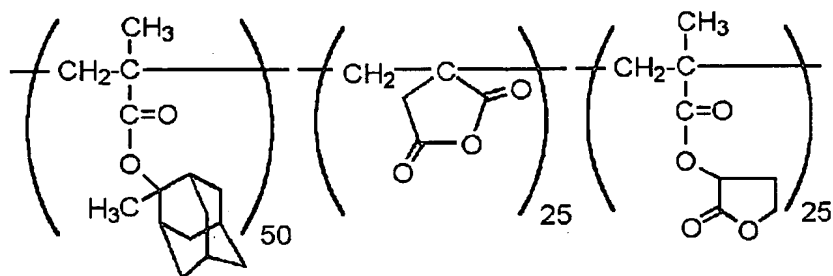
The same operation as the synthetic example 3 was performed except having taught methacrylic-acid 2-methyl-2-adamantyl and itaconic acid anhydride by the mole ratio (20.0g : 6.4g) of 60:40. Consequently, it is shown by the following formula and, for the composition mole ratio of each unit, weight average molecular weight is abbreviation at 60:40. The copolymer of 8,000 was obtained.



[0043] The synthetic example 5 (synthesis of a resin A3)

The alpha-meta-***** yloxy-gamma-butyrolactone and itaconic acid anhydride which were obtained in the methacrylic-acid 2-methyl-2-adamantyl obtained in the synthetic example 1 and the synthetic example 2 were taught by the mole ratio (20.0g : 7.3g : 4.8g) of 50:25:25, the twice [2 weight] as many methyl isobutyl ketone as all monomers was added, and it considered as the solution. there -- initiator ***** -- an azobisisobutyronitril -- the total amount of monomers -- receiving -- one mol % -- it added and heated at 90 degrees C for about 8 hours. Then, operation of having filled a lot of heptanes with a reaction mixture, and settling it was performed twice, and was refined. Consequently, it is shown by the following formula and, for the composition mole ratio of each unit, weight average molecular weight is abbreviation at 50:25:25. The copolymer of 8,000 was obtained.

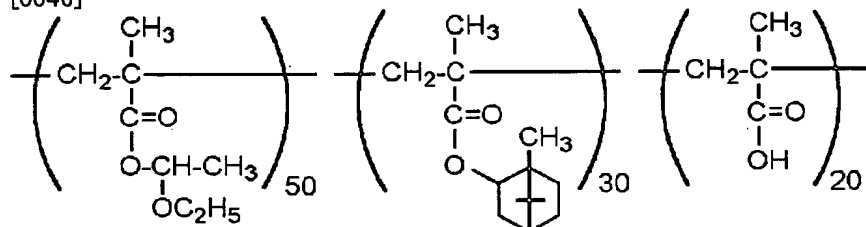
[0044]



[0045] The synthetic example 6 (for synthetic : comparison of a resin AX)

A methacrylic-acid 1-ethoxy ethyl, methacrylic-acid isobornyl, and the methacrylic acid were taught by the mole ratio (31.6g : 26.7g : 6.9g) of 5:3:2, the twice [2 weight] as many methyl isobutyl ketone as all monomers was added, and it considered as the solution. there -- initiator ***** -- an azobisisobutyronitril -- the total amount of monomers -- receiving -- two mol % -- it added and heated at 80 degrees C for about 8 hours Then, operation of having filled a lot of heptanes with a reaction mixture, and settling it was performed twice, and was refined. Consequently, it is shown by the following formula and, for the composition mole ratio of each unit, weight average molecular weight is abbreviation at 50:30:20. 10,000 The copolymer was obtained.

[0046]



[0047] It is 4-methylphenyl diphenyl sulfonium considering the resin shown in Table 1 for every example 1-4 and example 1 of a comparison, - 2 each example as the ten sections and an acid generator. It melted among the solvent 60 section which makes trifluoromethane sulfonate (product made from Green Chemistry) the 0.20 sections and a quencher, shows 2 and 6-diisopropyl aniline to 0.015 *****, and shows these in Table 1, it filtered with the VCF made from a fluoro resin of 0.2 micrometers of apertures further, and resist liquid It applied to the silicon wafer which applied the silicon wafer (contact angle of 60 degrees of water) or the organic antireflection film which processed this by the hexamethyldisilazane (HMDS) so that the thickness after xerensis might be set to 0.455 micrometers. An organic antireflection film is "DUV-18L" of Brewer. It was made to apply and form so that it may become the thickness of 570** on the ***** conditions for 215 degrees C and 60 seconds. The prebaking after a resist liquid application is the conditions for 120 degrees C and 60 seconds, and was performed on the direct hot plate.

[0048] in this way -- a resist -- a layer -- having formed -- a wafer -- KrF -- an excimer -- a stepper -- [-- Co., Ltd. -- NIKON -- make -- " -- NSR -- 2205 -- EX -- 12 -- B -- " -- NA -- = -- 0.55 --] -- using -- a line and a space pattern -- having exposed . Next, post exposition jar ***** (PEB) was performed on the conditions for 120 degrees C and 60 seconds on the hot plate. Next, the developer which diluted the tetramethylammonium hydroxide aqueous solution or it with ultrapure water 2.38% of the weight as shown in Table 1 performed paddle development for 60 seconds. The pattern after development was observed by the scanning electron microscope, and photographic sensitivity and resolution were investigated by the following technique about the pattern obtained from the resist layer prepared on the organic antireflection film substrate.

[0049] Photographic sensitivity: It displayed with the light exposure (effective photographic sensitivity) from which a 0.3-micrometer line and a space pattern are set to 1:1.

[0050] Resolution: It displayed with the lower limit of the line separated with the light exposure of effective photographic sensitivity, and a space pattern.

[0051] Moreover, what is pasted up on the substrate with the light exposure from which adhesive evaluation is performed about the pattern on the substrate which does not prepare an organic antireflection film, and a 0.3-micrometer line and a space pattern are set to 1:1 was displayed as O, and what has separated was displayed as x. It is shown in Table 1 with the above resin and solvent using the result.

[0052]

[Table 1]

***** Example No. Resin Solvent * Developer
Effective photographic sensitivity Resolution Adhesive property

***** Example 1 A1 PGMEA He has no dilution. 25 mJ/cm2 0.21 micrometers O ** 2 A1 MAK He has no dilution. 35 mJ/cm2 0.18 micrometers O ** 3 A2 ** He has no dilution. 35 mJ/cm2 0.18 micrometers O** 4 A3 PGMEA He has no dilution. 25 mJ/cm2 0.19 micrometers O

***** Example 1 of a comparison AX PGMEA 1/20 dilution 40 mJ/cm2 0.23 micrometers O ** 2 AX ** One fifth Dilution 35 mJ/cm2 0.25micrometer

x***** [0053] (Footnote of Table 1) * Solvent
PGMEA : Propylene-glycol-monomethyl-ether acetate MAK : 2-heptanone (alias methyl amyl ketone)

[0054] Even if developer concentration is high, the resins A1 and A2 or the resist using A3 does not cause development peeling, and is excellent in the adhesive property over a substrate with this invention, as shown in Table 1. Moreover, resolution is also improved and photographic sensitivity is not spoiled. The constituent used in the examples 1-4 gives the resist resist pattern of the performance which was excellent in exposure by ArF excimer laser exposure machine similarly.

[0055]

[Effect of the Invention] The chemistry amplification type positive-resist constituent of this invention is excellent in

the adhesive property to a substrate, and its resist many performances, such as photographic sensitivity and resolution, are also good. Therefore, this constituent fits the exposure which used KrF excimer laser, ArF excimer laser, etc., and gives the resist pattern of a high performance by it.

[Translation done.]